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Some Comments on the Official Protocol

[Categories B.1, C.1, C.2, C.3, C.4, C.5]

Document No. 1 and NWG/RFC No. 107 gave a very detailed description of connection establishment, connection termination and flow control over the Network. Throughout the implementation of the NCP it was discovered that the handling of ERR control commands, messages of types other than 0 (regular), 4 (nop), and 5 (rfnm), and messages with the From-imp bit on are not well discussed so that problems arise when they occur.

The Protocol is not complete if the above situations are not handled clearly, and the Host-Host Protocol Glitch Cleaning Committee should take this into consideration. In this document, experience with these unfavorable situations and suggestions for handling are given:

1. ERR Control Commands

In Document No. 1, the following error conditions are described:

a. Illegal Op. code.
b. End of message encountered before all expected parameters.
c. Bad socket polarity within commands.
d. Link number not in the range of $0 \leq L < 32$.
e. A request (other than RTS/STR) on a non-existent socket.
f. A request (ALL, GVB, RET, INR, INS) on a non-existent link number.
g. Transmit over non-existent link number.

other error situations are:

h. A request (GVB, RET, INR, INS) on an existent link, but connection is not established.

i. Transmit over an existent link, but connection is not established.
j. ALL or GVB on a send connection.
k. RET on a receive connection.
l. An attempt to send more than the allocated number of bits or messages.
m. ECO, ERP, ERR commands do not have the defined number of bits of data.

In Document No. 1, each site is supposed to document the information on their ERR command. No one has done that so far, and the main reason is we are not sure of what information is important. In NWG/RFC No. 107, the text portion of the ERR Commands is decided to have a fixed length of 80 bits because 80 bits is long enough to hold the longest non-ERR command. In some of the above error conditions, more information than the command itself is desirable. It was noted that these error conditions arise very often in the experimental stage of the NCP. If every NCP is operating properly, none of them should ever occur. The ERR commands are therefore, an excellent debugging tool for the protocol. So it is desirable to define a set of possible error conditions, and for each condition, define a set of arguments in the corresponding ERR command so that enough information is given to tell what's wrong. The suggested arguments for each situation (A - m) are listed below:

a. 1. Op. code in error.
   2. Part of message following op. code (A maximum of 72 bits).

b, c, d, e, f. 1. The command in error.

g. 1. Link number
   2. Beginning of message (A maximum of 72 bits)

h. 1. Command in error.
   2. Socket numbers for the connection.
   3. Status of the connection.

i. 1. Link number
   2. Beginning of message (A maximum of 72 bits)
   3. Socket numbers for the connection.
   4. Status of the connection.

j, k. 1. Command in error.
   2. Socket numbers for the connection.

l. 1. Link number
   2. Beginning of message (A maximum of 72 bits)
   3. Number of bits sent.
   4. Number of bits allocated.
   5. Number of messages allocated.

m. 1. The Command in error.

Each of the ERR commands should have a special error code (8 bits) to tell the error type. An 80-bits field to store the command in error, and additional fields for socket numbers and other information.

2. Imp-to-host messages of types other than 0, 4, and 5.

From the BBN report 1822, the following message types will cause difficulty in the implementation of the Protocol.

a. Type 2 - Imp going down.
b. Type 7 - Destination host or imp dead.
c. Type 9 - Incomplete transmission.

It was discovered that on sending a message to a site ~~whole~~ whose imp or host is not running. A Type 7 or Type 9 message is returned. This can happen in two situations:

a. The foreign host or imp is not up at all.
b. Some connections have been established, and the foreign host or imp goes down.

The first situation does not cause much problem because the NCP has no entry in its table corresponding to this site.

The second situation is more complicated, because if the table entries for the connections to the dead host are not cleared, by the time this host comes up again, the table entries still exist and the information will be very misleading. One suggestion to solve this problem is

a. Whenever a NCP comes up, it sends a RESET Control Command to every other site.
b. Associated with each site there is a bit called the up-bit. If a RESET-reply command is received from some site, the corresponding up-bit is set to 1. Race condition can be avoided by ignoring all messages from sites which have not reutrned the RESET-reply command.
c. Messages can only be sent to sites with the up-bit on.
d. If a RESET control command is received, the Table entries corresponding to the site are cleared, a RESET-reply is immediately returned, and the up-bit for the site is set.
e. The up-bit is reset to 0 when a Type 7 or Type 9 message is received from a particular site.

The above solution will handle the Type 2 messages also. When a host receives a Type 2 message, there is no way for it to tell the other NCP's that its imp is going down. Subsequent messages to this host will return a Type 7 or 9 message. The solution above will then come into effect.

With the introduction of the RESET and RESET-reply Control command, the ECO and ERP control command are no longer important and should be removed.

3. Messages with the From-imp bit on.

These kinds of messages are not discussed at all. Some statistical measurements have been made on messages with the From-imp bit on. We should clasify what these messages represent.